VOLUME 81 PAPER No. 832

PROCEEDINGS

AMERICAN SOCIETY
OF
CIVIL ENGINEERS

NOVEMBER, 1955

IMPACT OF ATOMIC DEVELOPMENT ON GROWTH AND PLANNING OF URBAN REGIONS

by Park H. Martin, Hon. M. ASCE

CITY PLANNING DIVISION

{Discussion open until March 1, 1956}

Copyright 1955 by the AMERICAN SOCIETY OF CIVIL ENGINEERS
Printed in the United States of America

Headquarters of the Society
33 W. 39th St.
New York 18, N. Y.

PRICE $0.50 PER COPY

This paper is one of a group given at Lehigh University and Lafayette College at Bethlehem and Easton, Pa., on October 22, 1954, at a special program of the City Planning Division in conjunction with the Lehigh Valley Section. It was designed to bring out the relationship between future commercial applications of the use of atomic fuel for developing power and city and regional planning.

The following papers comprise the program: "Elementary Principles of Nuclear Power" (Proc. Paper 768) by John W. Landis, Customer Relations, Atomic Energy Div., The Babcock and Wilcox Co., New York, N. Y.,; "Prospects for Use of Nuclear Power" (Proc. Paper 767) by H. W. Huntley, Member, Atomic Power Study, General Electric Co., Schenectady, N. Y.; "Impact of Atomic Development on Growth and Planning of Urban Regions" (Proc. Paper 832) by Park H. Martin, M. ASCE, Executive Director, Allegheny Conference on Community Development, Pittsburgh, Pa.; "Environmental Considerations in the Development of the Atomic Energy Industry" (Proc. Paper 766) by Arthur E. Gorman, M. ASCE, Sanitary Engineer, U.S. Atomic Energy Commission, Washington, D. C.; and "Local Government in the Atomic Age" (Proc. Paper 833) by Harold A. Alderfer, Prof. of Political Science, Penn State Univ., State College, Pa.

These papers presented, first, the methods by which nuclear energy could be converted into power, reviewed the prospects for such power, and then took up: the effect that such atomic plants and the power which they would create might have on the future planning of metropolitan areas, the ways in which the public health might be protected against any harmful wastes, and, finally, the revisions in governmental structure that might be desirable as a result of the atomic age.

They pointed out that careful consideration should be given to site selection, both in consideration of adjoining developments and to assure safe disposal of radioactive wastes. Assurance was given that safe designs are within the realm of sound engineering. At the same time, it was pointed out that the potential new industry presents a challenge not only to engineers but to other scientists, private management, and public officials involved.

Reprints from this publication may be made on condition that the full title of paper, name of author, page reference (or paper number), and date of publication by the Society are given.

The Society is not responsible for any statement made or opinion expressed in its publications.

This paper was published at 1745 S. State Street, Ann Arbor, Mich., by the American Society of Civil Engineers. Editorial and General Offices are at 33 West Thirty-ninth Street, New York 18, N.Y.

IMPACT OF ATOMIC DEVELOPMENT ON GROWTH AND PLANNING OF URBAN REGIONS[1]

Park H. Martin,[2] Hon. M. ASCE

SUMMARY

The peace time or controlled use of nuclear energy, as far as is known today, does not seem to indicate a major impact on regional planning. The result of controlled use of nuclear energy is heat presently to be transformed into electrical energy. This means a new basic source of energy with the same end product. Urban regional planning involves consideration of many factors. Problems of industrial location, highways, streets, parking, recreation and parks, and varied municipal services still remain for the planner to solve. This new energy source does not seem to affect the solution of such problems in the light of present knowledge.

This subject is part of a panel presentation on Nuclear Energy—its use and its impact on growth and planning of Urban Areas. Without knowing what the other members of the panel may say, I am taking the liberty of presenting facts bearing on my subject which may also be given by others. Without such facts before us, it would be impossible to relate the effect of nuclear energy on planning of urban regions.

What I say in reference to nuclear energy may differ with what others on the panel may say. I must accept this chance in the knowledge that some worthwhile discussions may result, with the expression of different points of view.

An understanding of the valid and known facts on the use of nuclear energy for peacetime purposes is essential in appraising the effect on urban areas. These facts, I believe, can be pinpointed. This means separating truth from fiction, rumor, or speculation. While a planner must look into the future, he is not warranted in making wild assumptions that may result in wasteful expenditure of either public or private funds.

According to a statement by Mr. C. H. Weaver, Manager of the Atomic Energy Division of the Westinghouse Electric Corporation, "The field of power reactors stands today where the infant electrical industry stood some 75 years ago, and since there is hesitancy on the part of many in the field of atomic research to make unqualified statements as to the broad use of peace atomic energy, one must then pass quickly from the field of assured knowledge into the field of speculation and forecast."

---

1. Presented at the meeting of the American Society of Civil Engineers, City Planning Div. at Lehigh University, Friday, October 22, 1954.
2. Executive Director, Allegheny Conference on Community Development, Pittsburgh, Pa.

We start with two known broad uses—atomic energy through the atomic bomb for war purposes, and atomic energy for peacetime use. Peacetime use means the control of atomic energy through reactors to produce controlled energy and power. War use of the atomic bomb is an uncontrolled use.

Since more is known about the uncontrolled use of atomic energy, let us take the war use first. The atomic bomb as a weapon of war and,therefore, destruction has struck fear into the minds of men. This threat of death and destruction has given further emphasis and support to those planners who even prior to its existence advocated decentralization of industry and cities. We must unquestionably consider the effect of this threat to the future of our urban areas.

But first, let us see what we mean by decentralization. Does it mean moving parts of cities or urban areas ten miles, twenty miles, fifty miles, or some other distance? Or does it mean setting up new cities or towns in isolated areas? Or does it mean moving industry to small towns and cities which are now in existence. All or any such proposals involve people and public and private investments. It is true that certain large industries have been establishing branch plants in small towns, away from cities; small industries have also chosen to locate in similar areas. This trend has been and is taking place not so much because of dangers of war and bombing, but because of vexing problems that exist in the large urban areas, such as traffic congestion, poor transportation, inadequate parking, housing, and others.

I come from a great industrial region, the Pittsburgh area. For forty miles along the Monongahela River, forty miles along the Ohio River, and to a lesser extent along the Allegheny River, great basic industries are located there. To decentralize this region of great industry would cost literally billions of dollars in public and private funds.

This is not an exaggerated statement, because since 1945 more than $1,500,000,000 of private funds has been spent in this area on plant expansion and modernization on new plants. Without considering other important factors, the simple economics seem to preclude such decentralization. And what I have said of the Pittsburgh District can be said of other major industrial areas across the nation. If such decentralization, even if practicable and desirable, is ever to be accomplished, it is my opinion that it can only be undertaken by the use of public funds. This, I believe, is not practicable nor will large scale decentralization be accomplished. This is not to infer that the trend toward locating small plants in smaller towns will come to an end. On the other hand I believe it will continue. In terms of our total national production, however, it will only represent a small part. Consideration of decentralization of industry emphasizes the need of urban regional planning. Municipal boundaries, whether of city or county, which may be only part of a region, impose limitations on planning which should be on a regional basis. One problem confronting regional planners is the narrow and limited viewpoint of many local officials. If regional planning is to be effective, this attitude must be changed. Scientist Ralph Lapp has pointed out that, "Industrial vulnerability has actually increased since the war, and today our industrial vulnerability is about 20 % higher than on V-J Day."

Let us take a look at what is happening as far as the population growth of urban areas is concerned. In the United States,according to the census of 1950, urban areas still continue to grow, though central city growth seems to be tapering off.

This past summer I spent two months in Europe visiting at least fifteen major cities in Spain, Italy, Switzerland, Western Germany, Holland, Belgium, France, England, and Scotland. In not one single area did I observe any sign of decentralization. On the contrary, I saw large volumes of new housing in and around the perimeter of all European cities visited. In fact, the badly bombed West German cities of Frankfurt, Mainz, Cologne, and Dusseldorf are rebuilding on ruined areas.

Whether it is a calculated risk or a matter of economics, it seems that as planners we must accept the conclusion that atomic energy as a war weapon is not changing the course of growth and expansion of our urban areas.

This being the case, we should think in terms of planning for Civil Defense. This important problem facing the cities of today should emphasize the need of greater attention to the planning of highways, traffic, transportation, and other vital community services.

Peaceable Atomic Energy

Speaking on television from the summer White House in Denver, Colorado, at the groundbreaking ceremonies for the new atomic power plant now being built at Shippingport, Pennsylvania, President Eisenhower termed that day "The Miracle Day." Mr. Gwilym Price, President of Westinghouse Electric Corporation, also said, "Atomic Energy will make readily available electric power to any corner of the earth."

The printed program contained the following statement: "While there is still considerable difference of opinion as to just when electricity produced from nuclear fuel will be competitive with electricity produced by conventional fuels, the concensus of opinion now is that it will be in the foreseeable future. The Atomic Energy Commission is of the opinion that this goal will be reached within a decade or two." This appears to be a general statement that might well be modified depending upon what area is under consideration. For instance, the time factor of when nuclear energy will be competitive with energy from conventional sources might be one thing in Pennsylvania with its coal reserves, another in Maine or Florida with no coal, or another in Great Britain or France which now are faced with exhaustion of their higher-grade coal supply.

Let us remember that nuclear energy is not a power source until finally converted into electricity. This means that today it is only replacing existing fuels or energy sources.

The future, however, may and probably does hold something different because of our dwindling power reserves. What is the situation in regard to known supplies or reserves of such fuels as coal, oil, and gas? What are the estimated future energy demands for an increasing population and for industrial expansion? Let us look at the question of future needs.

Mr. A. C. Monteith, Vice President, Westinghouse Electric Corporation, in a recent paper said, "United States population is exploding. Demands for energy to fill the needs of this population are still more explosive. Our historic sources of energy will fall far short of meeting requirements that are now definitely foreseeable. The energy bank simply doesn't have enough funds in it to meet the withdrawals that will be made in the next 100 years. We are definitely on the road to depletion of some sources of energy."

The consultant to A. E. C., Mr. Palmer Putnam, predicts that in 75 years United States coal will be depleted to the point where it will cost too much

to be used for electricity. From what is now known of the use that can be made of atomic energy, it seems assured that it may well be our main future source of energy. This will take the form of heat, steam, and electricity.

There is a wide difference of opinion as to how soon electricity can be produced economically at an atomic power plant and be competitive with electricity as it is now generated. Mr. Weaver, whom I have quoted, pointed out that in the field of power reactors we stand today where the infant electrical industry stood some 75 years ago. Quoting from an article in the September, 1954, issue of READER'S DIGEST by Harland Manchester, Science Editor of the Digest since 1943, under the title of What Are The Actual Prospects For Atomic Power, we find this statement, "But the peacetime use of atomic power will not fulfill the gaudy prophecies that have been made about it. Some nuclear scientists believe, however, that with the experience gained in the next 10 or 20 years, it will be possible to make power from the atom at costs no higher than those of today's electricity. But they don't expect miracles."

Since all atomic reactors now known produce the following: Heat, neutrons, and fission products, we might take a quick look at some of the products of reactors other than heat.

THE ARCHITECTURAL FORUM for September, 1954, carried a story under the title of Does Atomic Radiation Promise a Building Revolution? This article says in part, "The gamma rays which are a by-product of nuclear fission are being harnessed to change molecular structure of many materials, sometimes effecting no commercially significant change, sometimes effecting a complete metamorphosis." Since the title of the Forum article is posed as a question, apparently the answer is not known at this time. One may be optimistic enough to believe that science will be able to harness atomic radiation to produce new types of building material. While this may produce an impact on the building industry, there are so many factors involved in the planning of cities, such as street and highway patterns, traffic and transportation, parking facilities, parks and recreation, population densities and municipal services, that there appears to be no indication now that it will affect the planning of cities to any great extent.

Now where does all that we know about peacetime atomic energy lead us to in the field of community growth and planning? Here is where we can start to mix some known information with a moderate dose of dreaming and speculation.

On the basis of the known information we have, the energy result of atomic power is heat, then steam, and then electricity. It seems pertinent to digress momentarily and remember that electrical energy at this time cannot be developed directly from atomic energy. Quoting a reliable source of information, the source of which I am not at liberty to state, we have . . . . "I wish I could say that we may convert nuclear energy directly into electrical energy . . . . but the date of any such development is buried in the future. . . . . Steam is a clumsy medium for converting nuclear energy into electrical energy, but this is the most practical method we see today. . . . . In our present effort, the steam will drive turbine generators."

It would appear from the planning viewpoint then that the impact of nuclear energy will be mainly one of substitution of one source of energy for those presently used in the so-called, "Have Areas." In areas where energy sources are presently limited or non-existent, nuclear energy should provide energy sources that may well be an incentive for development and growth of industrial and manufacturing enterprises which do not now exist,

as well as help to provide better living conditions.

One of the problems of all industrial areas, depending upon coal as their power source, is the matter of smoke, dirt, and general air pollution. Certainly the use of nuclear energy could go far to help correct this situation. Air pollution should be greatly reduced and living conditions improved. While the medical profession has never pinpointed the deleterious effect of smoke upon the human system, they have expressed opinions as to its bad effects.

The primary product of the reactor is heat. While the costs of producing heat from nuclear power at present is far in excess of heat produced by conventional methods, it seems certain that as time goes on, the present cost of producing heat from nuclear sources will be greatly reduced under present costs. Substantially all the buildings in the Golden Triangle in Pittsburgh receive their heat from one central source, the Allegheny Steam Heating Company. Using coal for fuel, steam is generated and piped through conduits under streets into the various buildings. This provides a convenient and far cheaper method than individual heating units. With steam developed by cheap atomic energy, I can foresee the development of central heating plants in cities and towns. This, together with cheap electricity for cooking purposes, may well influence living habits in populous areas.

The city planner should now start to think of what, if anything, should be done in the matter of zoning to control the location of atomic energy plants. It seems necessary that zoning should impose controls on such plants not only from the standpoint of land use, but also from the standpoint of protection of persons and property from any possible danger from radioactivity. In our new zoning ordinance now being considered for Pittsburgh, we are thinking of making locations for reactors a conditional use, upon approval by the City Planning Commission. We are thinking of this despite the fact that the shell of the reactor at the new Duquesne Light Company-Westinghouse Atomic Energy Plant now in construction at Shippingport is to be so thick and so designed as to eliminate danger of radioactive elements as I understand it. Since the plant is located within one-quarter of a mile of the village of Shippingport, the designers appear confident that it is no hazard to the community.

It seems reasonable, however, for a city to retain control over the location of atomic energy plants, the same as it does over plants manufacturing dangerous explosive materials. The public will want this assurance of safety until the element of danger is removed.

One of the most important elements affecting community growth is that of transportation. The basic sources of power for this are oil, gasoline, and coal. It is too early to know to what extent nuclear energy will be used and how in this field. One need not be starry-eyed to forecast the use of nuclear energy in the field of transportation. Certainly it has been proven that it can be used in the case of the United States submarine, The Nautilus. Research will probably adapt it to smaller units of travel. Since again this would be a substitution of one power source for another, it is not clear as to the effect on planning of cities.

The Pittsburgh Press of September 17, 1954, carried the following statement by Lewis L. Strauss, Chairman of the A. E. C., "It is not too much to expect that our children will know of great periodic regional famines in the world as only matters of history, will travel effortlessly over the seas and under them, through the air with minimum of danger and at great speeds, and will experience a life span far longer than ours, as disease yields and

man comes to understand what causes him to age."

If, as the ARCHITECTURAL FORUM article predicts, the gamma rays which are a by-product of nuclear fission can be harnessed to change the molecular structure of materials, then the future may well hold possibilities for improvement in health and hygiene. It is at this point I venture into the future in raising the thought that one of the important responsibilities of the planner and of government is the disposal of garbage and sewage. May not either the gamma rays or some other by-product of nuclear fission be used to aid in this disposal process?

Yes, it is still early to know with any certainty as to the ultimate effect of nuclear energy and its by-products on community growth and planning. It is not too early to say, however, that those of us in the planning field concerned with community planning and growth must be continually alert to keep informed about the understanding of nuclear energy and its application to peacetime uses. The promises and forecasts that Mr. Manchester in his READER'S DIGEST article called gaudy prophecies, today, may be the realities of tomorrow. We as planners must be alert.